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Current Date/Time : 7/19/2012 2:43:59 PM

## Title:

The Evolution of Hydrocarbons in Saturn's Northern Storm Region

## Author Block:

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## Abstract:

The massive storm at 40N on Saturn that began in December 2010 has produced significant and lasting effects in the northern hemisphere on temperature and species abundances (Fletcher et al. 2011). The northern storm region was observed on several occasions between March 2011 and April 2012 by Cassini's Composite Infrared Spectrometer (CIRS) at a spectral resolution ( $0.5\text{ cm}^{-1}$ ) which permits the study of trace species in Saturn's stratosphere. During this time period, stratospheric temperatures in regions referred to as "beacons" (warm regions at specific longitudes at the latitude of the storm) became significantly warmer than pre-storm values of 140K, peaking near 220K, and subsequently cooling. These warm temperatures led to greatly enhanced infrared emission due to  $\text{C}_4\text{H}_2$ ,  $\text{C}_3\text{H}_4$ ,  $\text{C}_2\text{H}_2$ , and  $\text{C}_2\text{H}_6$  in the stratosphere as well as the first detection of  $\text{C}_2\text{H}_4$  on Saturn in the thermal infrared (Hesman et al. 2012). Using  $\text{CH}_4$  as a thermometer of Saturn's stratosphere in the beacon regions, we can derive the mixing ratios of each of these molecules. The most common hydrocarbons ( $\text{C}_2\text{H}_2$  and  $\text{C}_2\text{H}_6$ ) serve as dynamical tracers on Saturn and their abundances may constrain vertical motion in the stratosphere. All of these hydrocarbons are products of methane photolysis. Since many of the photochemical reactions that produce heavier hydrocarbons such as  $\text{C}_4\text{H}_2$  and  $\text{C}_3\text{H}_4$  are temperature sensitive, the beacon region provides a natural laboratory for studying these reactions on Saturn. We will discuss the time evolution of the abundances of each of these hydrocarbons from their pre-storm values, through the period of maximum heating, and during the period of cooling that is taking place in Saturn's stratosphere.

## References:

Fletcher, L. N. et al., 2011. Thermal Structure and Dynamics of Saturn's Northern Springtime Disturbance. *Science* 332, 1413-1417.

Hesman, B. E. et al., 2012. Elusive Ethylene Detected in Saturn's Northern Storm Region (submitted).

Category:

Jovian Planets: Atmosphere

Additional Information (Complete):

Did you give a contributed presentation in 2010 (Pasadena)?: No

Did you give a contributed presentation in 2011 (Nantes)?: Yes - oral

Student Status: None

Special Instructions: Please schedule adjacent to Hesman et al in Jovian Atmospheres.

I am willing to serve as a Chair: Yes

(1) Area of Expertise: Jovian Planets: Atmosphere

I have a video for Press Officer review: No

Newsworthy?: No

Status: Complete

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